



THE RADAR POST

NWS GOODLAND'S NEWSLETTER SINCE 2017



Volume 6, Issue 2

Winter 2023



Message from the MIC



As 2023 comes to a close I wanted to thank everyone for your assistance in our mission to protect lives and property throughout a busy year! From daily cooperative observations to reporting severe weather and sharing our messages on social media, we would not be able to reach and inform those in our forecast area without your help. On behalf of the staff of the National Weather Service in Goodland, thank you for all that you do!

Looking back over the last year there were numerous weather events that were notable. We saw severe drought conditions improve across most of the area, so much so that despite having a very dry September through November, Goodland will still end the year at least 2 inches above normal. On August 8th an intense supercell thunderstorm spawned numerous tornadoes in Yuma County, as well as the largest hailstone ever recorded in the state of Colorado. Finally we wrapped up the year with an intense blizzard that impacted much of the Central Plains during the Christmas holiday. One thing that stuck with me from each of the events is how the communities pulled together to help each other, whether that be from sheltering stranded motorists to helping those suffering from the aftermath of a direct hit from a tornado.

As the Meteorologist in Charge, I will continue to commit myself to ensuring that the office not only provides the best scientific information possible, but we do our best to aid all of the communities before, during and after a storm. Hope everyone has a great 2024!

-Jeremy Martin, Meteorologist-In-Charge

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SHAREHOLDERS REPORT

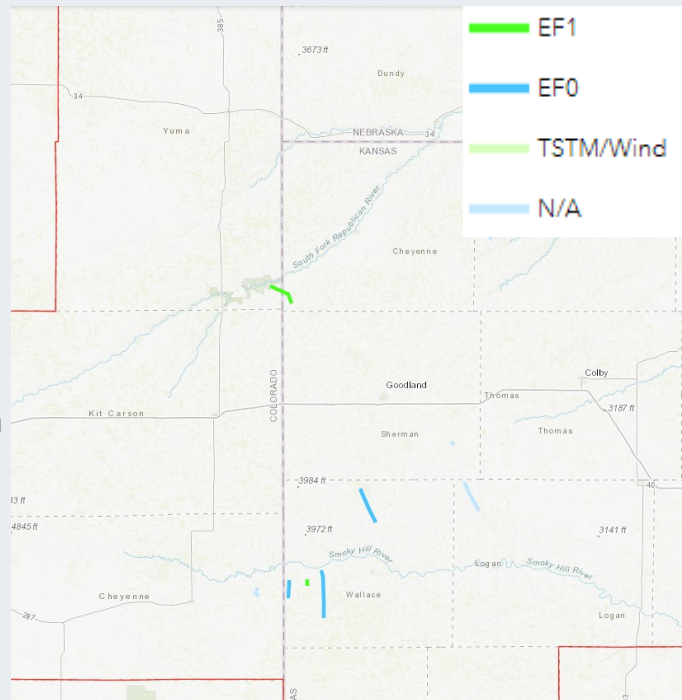
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May 11-12th Severe Weather Outbreak

By: Jesse Lundquist

An unseasonably strong weather system moved over the Tri-State Area from the Desert Southwest in mid May. Accompanying the weather system was a frontal boundary which stalled over the Tri-State Area during this timeframe. The front served as a focus for storm development. Thunderstorms began to develop during the morning hours of the 11th, with the intensity of the storms increasing as the day progressed.

The severe weather reached a peak during the afternoon. During this time there were scattered thunderstorms across the Tri-State Area. The environment was exceptionally favorable for any thunderstorm updraft to rotate, which would allow tornadoes to form with any thunderstorm. Despite the intense thunderstorm updrafts, nearly all of the updrafts which fueled the thunderstorms were not tall enough to support large hail, even though they were rotating enough to support tornado development. As a result, there were almost no reports of hail with these thunderstorms. Of the few hailstones that were reported, the largest was half dollar size near Sharon Springs.



Nearly all of the tornadoes on the 11th occurred over open country. The tornado which caused the most damage was an EF-1 in Wallace County. It formed just south of the high school in Weskan, causing damage to the new bleachers that were purchased by a community fundraiser and had just been installed. The tornado also caused damage to the roof of the school building that had been repaired from storm damage that had occurred last year. Even though this tornado caused the most damage, it only had a path length of a mile and a quarter and had a maximum width of 175 yards. Conversely one of the longest tornado path lengths was almost eight and a half miles. This one, also in Wallace County, only impacted one residence, breaking sliding glass windows and lifting part of the porch roof back onto the house. The shortest path length was three quarters of a mile long in southeast Sherman County. There were ten tornadoes in Northwest Kansas on this day, which is nearly half of the annual number of tornadoes during a typical year.

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There were two reports of thunderstorm winds during the day. One report came from Campus in Gove County. Thunderstorm wind gusts were estimated to be 60-65 MPH. The other report came from near Kirk, CO with a measured wind speed of 64 MPH.

By mid evening the threat for tornadoes ended as temperatures cooled. However the threat for hazardous weather continued. The environment was rich with moisture, which allowed the storm activity to produce high rainfall rates. A compounding problem was the training characteristics of the thunderstorms, bringing repeated rounds of heavy rainfall to the same location. The town of Ludell, KS was impacted the most by the repeated rounds of heavy rainfall. Beaver Creek, which flows by Ludell, was full of water from the heavy rainfall upstream during the day. The added water from Beaver Creek exacerbated the flooding situation at Ludell, causing flood waters to go over the road between Ludell and Herndon during the early morning hours of the 12th.

Massive May Flooding - May 26, 2023

By: Clint Alexander

The flooding that occurred on May 26-28, 2023 made it a day that many people in Southwestern Nebraska and Northwestern Kansas won't soon forget. During the afternoon of the 25th, slow moving, high precipitation thunderstorms formed in Eastern Colorado and moved northeast. As the storms continued into the evening hours, severe hail was reported, along with heavy rain. Near midnight going into the 26th, the storms slowed and began to back-build, which led to flooding in Southwest Nebraska throughout the early morning hours. Later in the morning, the storms moved into Kansas and caused record flooding for the town of Herndon before finally moving out of the area mid-day. Flooding continued until the 28th but roads remained closed for days afterwards as crews worked to clear debris and make necessary repairs. In total, 6 to 10 inches of rain was reported across Dundy,

Hitchcock and Red Willow counties in Nebraska, with similar amounts of rain reported in northern Rawlins and Decatur counties in Kansas.



Just after 11:30 PM on the 25th, the first Flash Flood Warning was issued in Dundy county Nebraska. Over the next 10 hours, numerous roads became flooded and subsequently closed, including Highway 34 from Benkelman to Trenton, and Highway 25 from Trenton to Highway 6. A train bridge west of Stratton was also damaged by the flooding and a road grader was also found to be almost fully submerged. We also received reports of houses becoming flooded and a water rescue being necessary in Stratton, NE. Although Stratton and surrounding areas were already under a "Considerable" Flash Flood Warning (Considerable tags in warnings are used to message a higher intensity impact than base warnings), the decision was made

to increase the warning tag to "Catastrophic." For about 3 hours, a Catastrophic Flash Flood Warning, also known as a Flash Flood Emergency, was in effect for Stratton and the surrounding areas. Some of the factors that were taken into account when making this decision were the severity of the flooding reports from local emergency management, the water rescue, and more heavy rain on the way.

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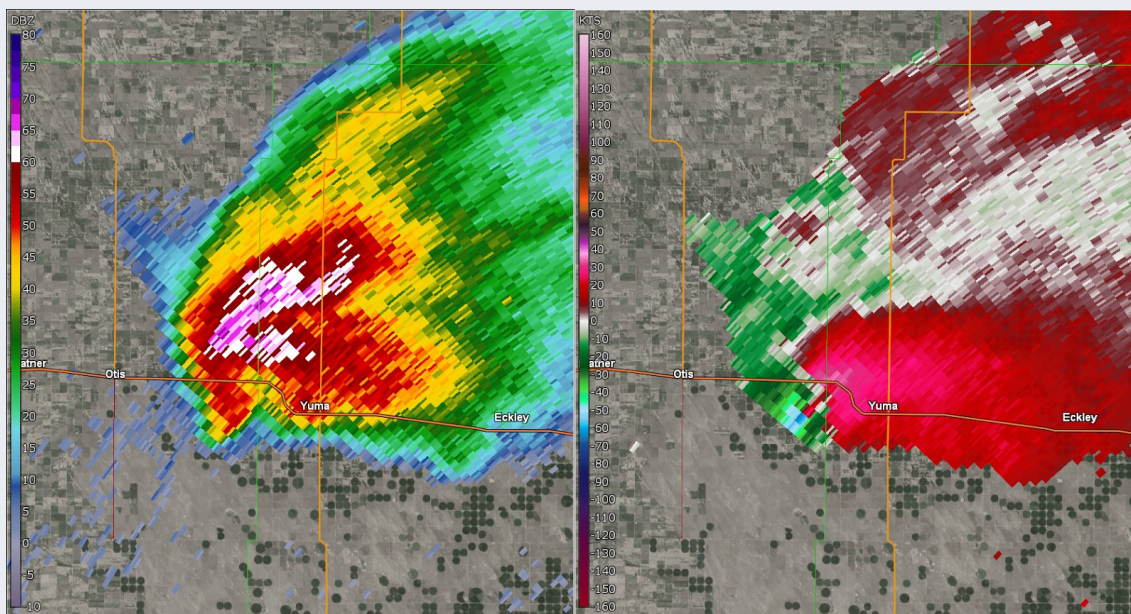
A Catastrophic Flash Flood Warning (Emergency) is the most extreme type of Flash Flood Warning available to be issued. This was only the second one ever issued from the Goodland Weather Forecast Office.

As the storms continued, they expanded southward into Rawlins County in Kansas, with the heaviest rain falling west of Herndon, KS. Around 9:30 AM, Law Enforcement in Herndon, KS began reporting street flooding, with flooding worsening as time progressed.

By 11:30 AM, the county emergency manager and dispatch both reported that Herndon had been cut off by all land routes due to flood waters, effectively surrounding the town. Around 12:45 PM, Ryan Murray (Rawlins County Emergency Manager) passed along concerns of a potential levee failure upstream of Herndon, which could flood the town. Considering there were no roads to drive on to evacuate the town, a levee failure would have been devastating. Thankfully, around this time the heavy rain had moved on to the northeast and waters stopped rising in the Herndon area. Throughout the evening hours, the waters slowly receded and the risk of levee failure lessened. It wasn't until late morning the following day on the 27th that roads became passable into Herndon again. On the 28th, almost three days after the flooding began, we received word that the flood waters in Southwest Nebraska had receded off the roads and road crews were able to begin working on them.

A Storm to Remember: The August 8th Yuma County Tornadoes

By: Kalitta Kauffman



Reflectivity (left) and Velocity (right) of the supercell at the start of the Yuma EF-3 Tornado as seen from KGLD.

The Tri-State Area had a more active severe weather season this year, with a few multi-tornado days. One day that will be remembered well is August 8th, 2023.

On this day, one long-lived supercell traveled across three counties over a span of just under seven hours. Around 1:45 PM MDT, a supercell thunderstorm began to develop along the Logan and Washington County line in Colorado. This storm remained nearly stationary as it matured before eventually moving southeast across Northeast Washington County. While in Washington County, the storm began the process of tornadogenesis. A brief EF-Unknown tornado occurred east of Otis, Colorado at 4:39 PM MDT before the storm caused straight-line wind damage near the town of Hyde.

At 4:57 PM MDT a large, dusty tornado developed just west of the Yuma County line. The tornado moved south-southeast across the county line damaging a residential property and some power poles before moving over open fields. As the storm moved near Yuma, it stayed southeast of the city where it completed three loops and dissipated on the fourth at 5:25 PM MDT. The tornado produced EF-3 damage in Yuma County, with significant damage to a residence, a machine shop, grain bins, and numerous power poles. The Yuma EF-3 was estimated to have 150 mph peak winds, a width of 212 yards, and to have traveled 9.2 miles.



Yuma EF-3 Tornado.
Image courtesy of Luke Goeglein.

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As the supercell continued south-southeast across Yuma County, it produced six more tornadoes over a total span of two hours and fifty minutes. The second tornado was a multivortex that occurred southeast of Yuma and traveled 5.3 miles. The tornado was rated EF-Unknown as no damage was observed. As the storm traveled along Highway 59 near the community of Abarr, it produced three more tornadoes on either side of the highway. Two of the tornadoes were rated EF-Unknown as they were over open land. The third tornado moved through two crop circles of corn, which made the path visible on satellite imagery. This tornado was rated EF-0.



Multivortex EF-Unknown tornado located southeast of Yuma, Colorado.

Image courtesy of Lila Hahn.

As the storm approached Highway 36 in Southern Yuma County, it began moving more east-southeast. The sixth tornado was produced north of the highway along County Road 8. From storm chaser reports, the tornado faded and reappeared a few times over a span of 14 minutes. Since it occurred over an open field, the tornado was rated an EF-Unknown.

The final tornado in East-Central Colorado began north of the South Republican State Wildlife Area in southeast Yuma County and traveled across the area into northern Kit Carson County for a length of 5.8 miles. While north of the wildlife area, the tornado caused EF-2 damage with winds estimated to peak at 120 mph. Damage occurred to nine power poles and half of an irrigation pivot along

County Road 2 before the tornado began moving southeast. No damage was reported in Kit Carson County. For more information about the tornadoes of August 8th, visit https://www.weather.gov/gld/Yuma_Tornado_August_8th_2023.



View of the supercell over Southeast Yuma County from north of Burlington, Colorado. Image courtesy of David Baxter.

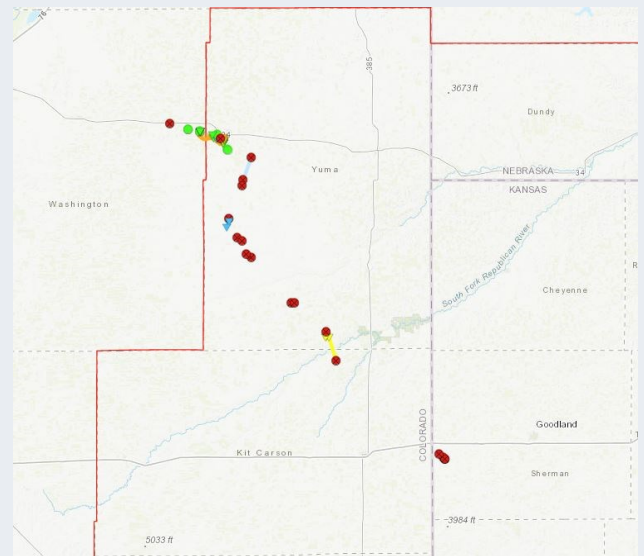


Image of all nine tornadoes that occurred between Washington, Yuma, Kit Carson, and Sherman Counties. Image courtesy of NWS Goodland.

Colorado's New State Record for Hailstone Diameter

By: Kalitta Kauffman

August 8th, 2023 had quite an impact on Yuma County, CO. Aside from the multiple tornadoes that occurred, large hail with a diameter of two inches and greater also fell across portions of the county. Throughout the afternoon and evening hours, a long-lived supercell



5.25" hailstone found near Kirk, Colorado on August 8th, 2023.

Measured via caliper. Image: Dan Fitts

thunderstorm moved south across the county. As the storm moved over southern Yuma County, it intensified and produced large to giant hail near the town of Kirk, CO, while undergoing tornadogenesis. Numerous storm chasers following the storm observed the hail falling and sent the Goodland office their reports.

One such report came from Dan Fitts, a chaser out of Western Nebraska. According to radar data and Mr. Fitts' report, the hailstone fell about 7:20 PM MDT at an old farm property

directly off of Highway 36 near Kirk, CO. Once the stone was found, it was measured via a caliper at 5.25 inches and a picture was taken of the measurement and stone. After the staff at the Goodland office contacted Mr. Fitts, the stone was delivered to the office a few hours later to be preserved until it could be officially measured.

How does a hailstone become a record? Great question! This is the second time since 2019 that the National Weather Service Office in Goodland has had the opportunity to observe and take part in this process. After viewing the report and contacting Dan Fitts, meteorologists at the Goodland office contacted the Colorado State Climatologist Russ Schumacher to request the stone be evaluated as a possible new record.



An IBHS expert measures the Kirk hailstone using a 3D laser scanner while visually comparing it to the Bethune hailstone in his hand.

Image: NWS Goodland

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On August 14th, Mr. Schumacher and experts from the Institute for Business and Home Safety (IBHS) visited the office for the official measurement. The IBHS experts evaluated the stone traditionally by weighing it on a scale and measuring it with a tape measure and caliper. They also used a 3D laser scanner. The table shows how the measurements compared to the 2019 record breaking hailstone found in Bethune, CO.

	Kirk, CO Hailstone (2023)	Bethune, CO Hailstone (2019)
Official Maximum Diameter	5.25 inches (Used for record)	4.83 inches
Maximum Diameter	4.608 inches (Measured Aug. 14th)	-
Circumference	11.18 inches (Measured Aug. 14th)	12.875 inches
Weight	7.29 ounces (Measured Aug. 14th)	8.5 ounces

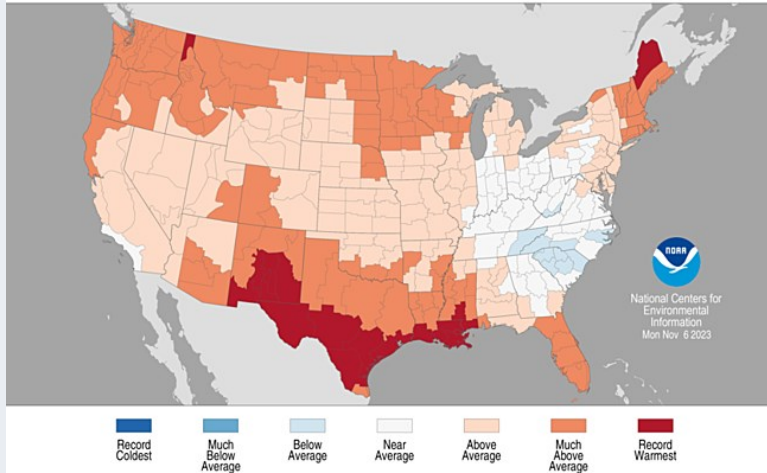
After careful evaluation of the measurements provided by both Mr. Fitts and IBHS, it was determined that the Kirk hailstone would set a new state record for hailstone diameter. The Bethune hailstone will remain the record holder for the other dimensions of weight, volume, and circumference.

For more information about the new record, visit https://www.ncei.noaa.gov/monitoring-content/extremes/scec/reports/20230926-Colorado-Hailstone.pdf?utm_source=twitter&utm_medium=social&utm_content=ap_mhf08o3gb8.

Reviewing The Temperatures and Precipitation From Late Spring Through Fall

By: Kyle Knight

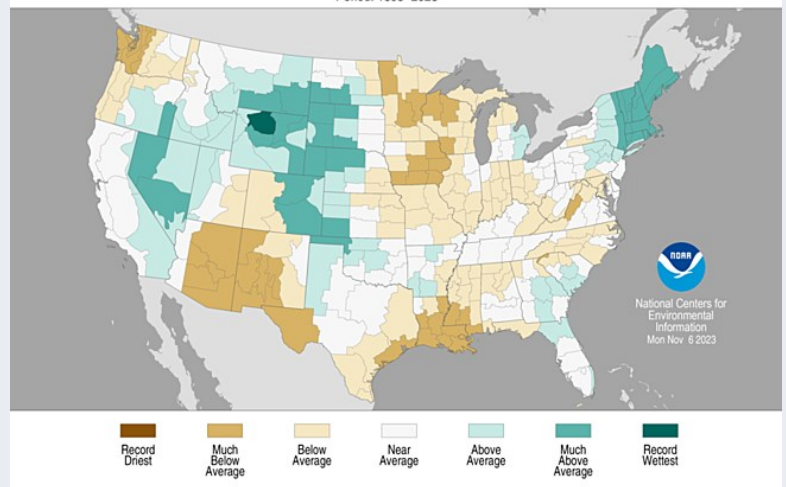
Divisional Average Temperature Ranks
May–October 2023
Period: 1895–2023



The map on the left shows the departure from the average temperatures for different divisions. For the entire Tri-State Area, temperatures were generally above average for May–October

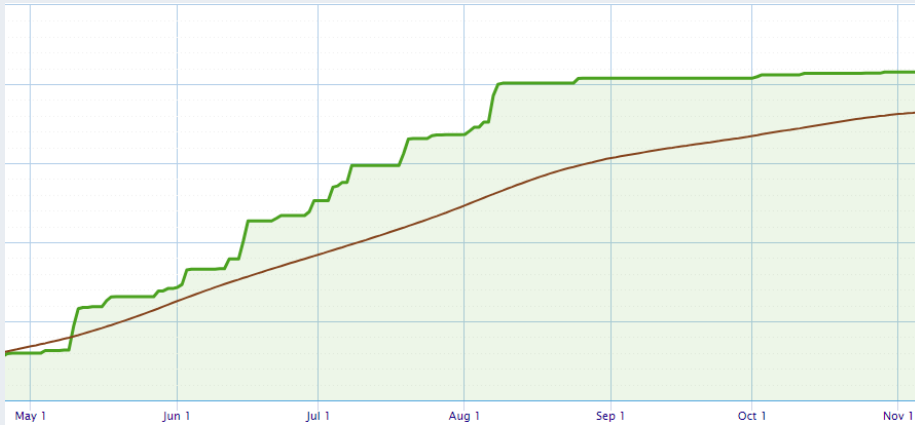
The map on the right shows the departure from the average precipitation for different divisions. Most of the Tri-State Area saw slightly above average precipitation for May–October. However, locales closer to Central Kansas were actually a bit below average.

Divisional Precipitation Ranks
May–October 2023
Period: 1895–2023



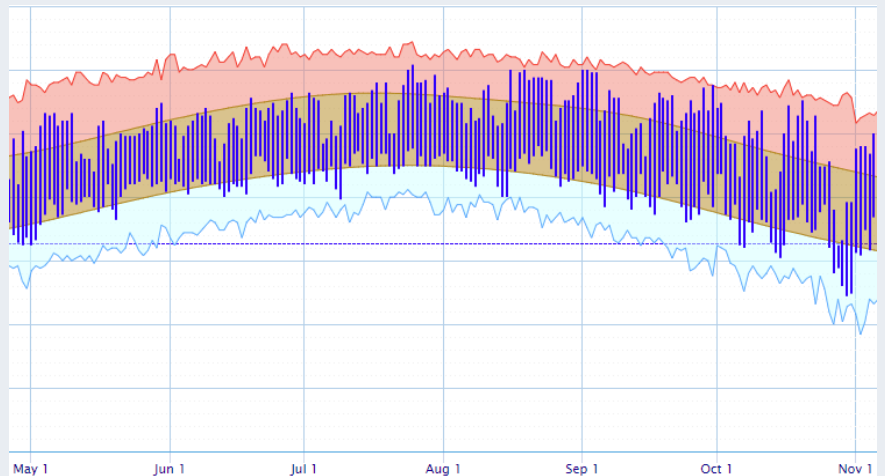
As a whole, the Tri-State Area saw relatively warm temperatures and slightly wetter conditions (as shown by the maps above) for much of the mid part of the year, though not necessarily at the same time. The graph to the bottom left shows the precipitation at Goodland with the brown line representing the average precipitation through that time period, while the green area shows observed precipitation through that time period. The graph to the bottom right shows the temperatures at Goodland with the blue bars showing the observed temperatures for the day, brown area showing average temperatures and the red and blue line showing record high and low temperatures for the day respectively.

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The graph on the left shows precipitation over May-October for Goodland. The green line is the total observed liquid precipitation while the brown line is the average. Goodland was above average for almost the whole season.

The graph on the right shows temperature over May-October for Goodland. The blue bar is observed temperatures (top of bar is the high bottom is the low), the light blue, brown and red areas are below average, average and above average temperatures respectively. The dotted line is the freezing point.



Looking more into the precipitation and temperature graphs from Goodland, temperatures for May-July were mostly around average. Precipitation on the other hand jumped to above average for the time period, with yearly precipitation totals starting to be well above average towards the end of July and into the beginning of August. After the beginning of August, the trends then inverted with less precipitation (less change in the green line) and temperatures more likely to be above average. This trend was noted across most of the area from Leoti to McCook and areas west. However, areas further east and closer to Central Kansas were more likely to see below average precipitation and above average temperatures. Most of the weather systems that brought precipitation to the area came from the west and north which generally led to lower cloud cover and storm coverage for this portion of the Tri-State Area.

Meet A Tech: Michael Turner

By: Clint Alexander

We would like to highlight one of our Electronics Technicians in this issue of the Newsletter, Michael Turner! Michael has worked at the National Weather Service in Goodland for five years, but originally hails from Milwaukee. Between Milwaukee and Goodland, Michael has lived all over the U.S. and in various other countries, and would like to travel to more. He has received a wide variety of training from the Community College of the Air Force, Bell South, Micron Technology, and the Federal Aviation Administration.

In his spare time, Michael enjoys reading, learning about history, camping, and spending time with his family. His favorite authors include Steven King, Kurt Vonnegut, George Orwell, Sun Tzu, H.G. Wells, and Steven Hawking. However, you won't be finding any Dickens in his library. He also has a passion working with veterans and church groups. According to Michael, the best band is the Beatles, but Dark Side of the Moon is the best album ever made. Michael gains inspiration from a multitude of people, including Jesse Owens, Cassius Clay, Audie Murphy, Amelia Earhart, Tim Nguyen, anyone who joins the military by choice, and Rosa Parks. A perfect weather day for Michael is 68 degrees and somewhat sunny. On the flip side, tornadoes in Oklahoma and Georgia were the most harrowing weather events Michael has experienced. Thank you for your continued hard work, Michael!



Summer 2023 Outreach Events

By: Tyler Trigg



Drew and Matthew at the office fair booth during the Sherman County fair.

Over the past summer the National Weather Service in Goodland has been actively participating in community events. These events ranged from a county fair to school talks to outdoor events across the forecast area.

Outreach events are a great way for our staff to get out and interact with those that we serve in the public. Meeting those we serve also help us garner an idea of what we can do to improve our services.

Some of the most popular events that the office has attended include county fairs and Rocks and Rockets in Colby. Staff that attend these events perform weather demonstrations, and answer any questions that may come up. In addition to these events we also participate in holiday parades.

Over the past summer we have also visited several schools such as Grinnell Grade School, Bird City schools, and career fairs in Bartley and Benkelman, NE, along with numerous school tours at the National Weather Service in Goodland.

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The office float for the Sherman County Fair parade.

We always enjoy interacting with the public, so if you would like meteorologists from our office to attend your event to give a talk at your school, organization, or if you would like to tour our office please contact the office via our email at nws.goodland@noaa.gov or Jesse.Lundquist@noaa.gov and we will do our best to accommodate.



Kyle and Drew at the Rock and Rockets event.

Snow Observers Needed

By: Jesse Lundquist



Do you measure snow after it falls to see how much you have received? If so, we are in need of your assistance this winter. The NWS in Goodland is in need of snow reports from anyone in the Tri-State Area. This would entail measuring snow in a representative location, i.e. not near a building or in a drift, then sending that information to us via social media or phone. Snow amounts may seem trivial, but they help us better understand how accurate the weather models were with the snow event so we can improve our forecast for the next one. This also helps document how much moisture fell across the Tri-State Area. Snow reports can even help road departments be better prepared for clearing roads if they know where the highest or lowest snow amounts occurred.

When sending in a snow report, please tell us your distance/direction from the nearest town, snow measurement to the nearest tenth of an inch, and when the measurement was taken. Any snow reports are valuable to us. Thank you for your assistance!



NWS Goodland Has Sweet Success With Office Challenge

By: Kalitta Kauffman

Did you know that the National Weather Service has goals for severe thunderstorm and tornado warnings? These goals are known as Government Performance and Results Act (GPRA) goals. At the Spring 2023 Severe Weather Seminar, NWS Goodland's then Science and Operations Officer, now Meteorologist-in-Charge, Jeremy Martin proposed a challenge to the meteorologists to improve the office's warning statistics. The challenge had several goals divided into two parts, severe thunderstorms and tornadoes. The first part of the challenge was to achieve an 80% Probability of Detection (POD)¹ for hail 1.5" in diameter or larger and wind gusts of 70 mph or greater with our Severe Thunderstorm Warnings. The second part of the challenge was to meet two of three GPRA goals for Tornado Warnings. These goals are a POD of 72% or greater, a False Alarm Rate (FAR)² of 71% or lower, and a lead time of 13 minutes. To complete the challenge, the meteorologists needed to meet either the severe or tornado part of the challenge for a pizza party. If the office was able to reach both parts goals, we could pie Jeremy in the face at the party.

This past year had a very active severe season with 413 Severe Thunderstorm Warnings and 65 Tornado Warnings. To put that into perspective, 2023 had the second highest number of Severe Thunderstorm Warnings since 1986, with the highest occurring in 2016.



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So how did the meteorologists do at NWS Goodland? Overall we had a great year with improvement on our warnings and verification. The table shows how we performed in regards to the local office challenge. 2023 statistics that are bolded indicate the goal was met.

	Goal	2023 Statistics
Severe Thunderstorm Warning POD ¹ (1.5" hail+ and 70+ mph winds)	80%	87.9%
Tornado Warning POD ¹	72% or higher	85.1%
Tornado Warning FAR ²	71% or lower	69.4%
Tornado Warning Lead Time	13 min	11 min

Since NWS Goodland was able to complete the challenge with much improved statistics, the office was able to have a pizza party and throw pies at our new Meteorologist-in-Charge. NWS Goodland would like to thank everyone who provided storm reports this past year. Please keep up the great work for this upcoming season!



1 Probability of detection is a measurement of successfully detecting a certain parameter

2 False alarm rate is measurement of unsuccessfully detecting something that did not happen when it did, or missing the magnitude

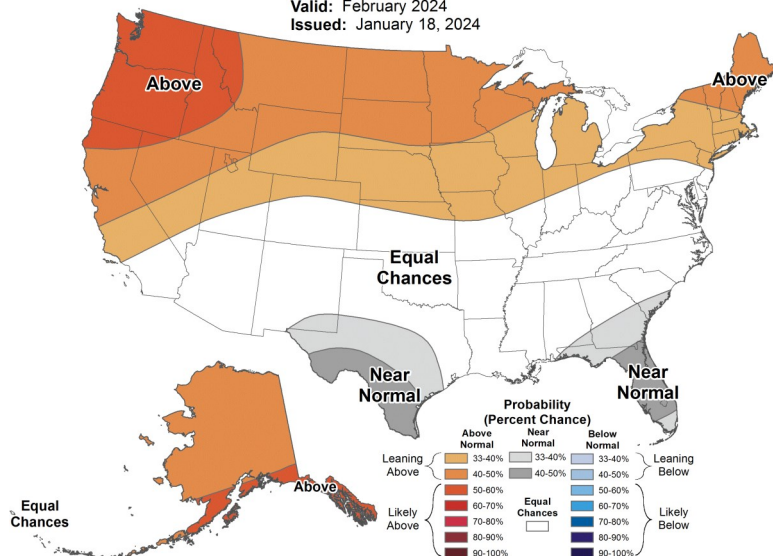
Climate Corner



Monthly Temperature Outlook



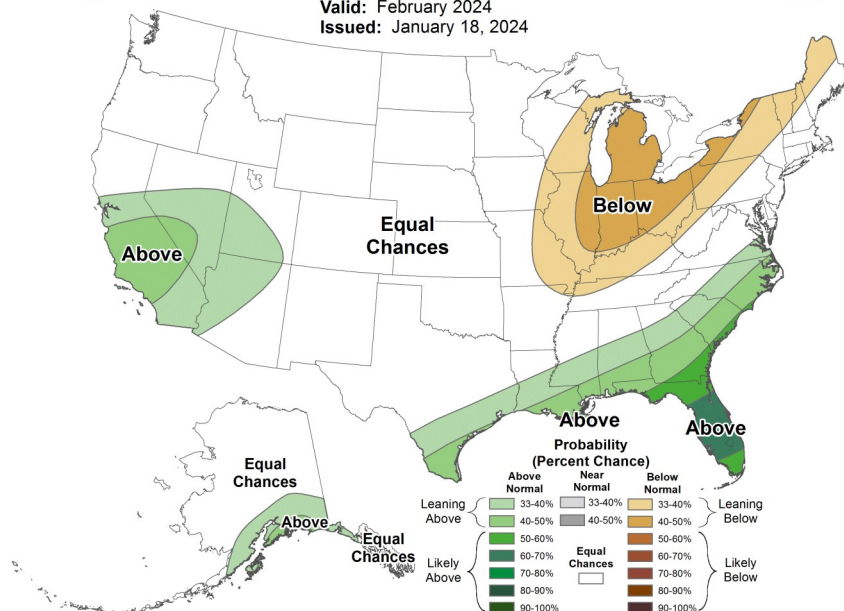
Valid: February 2024
Issued: January 18, 2024



Monthly Precipitation Outlook



Valid: February 2024
Issued: January 18, 2024



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One Month Summary

The outlook favors above normal temperatures and above, below, or average precipitation across the area. Average high temperatures are in the lower 40's, average low temperatures are in the upper teens, and average precipitation is around 0.3-0.4".

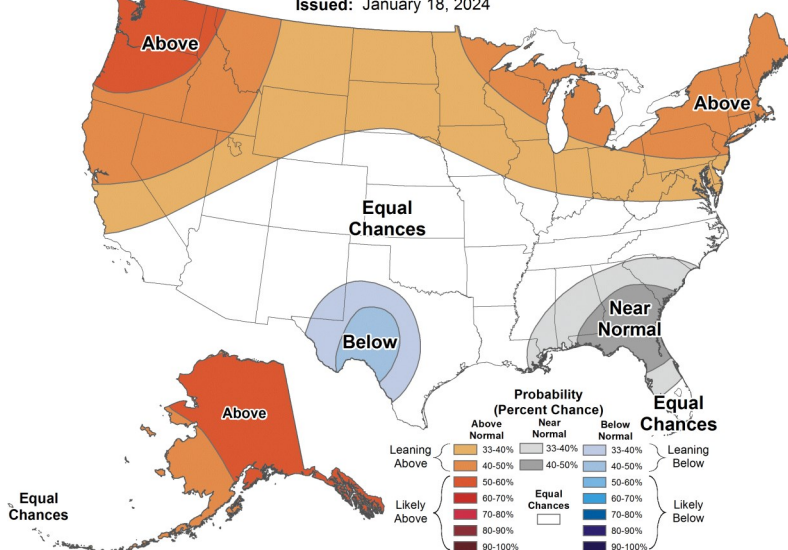
Climate Corner



Seasonal Temperature Outlook



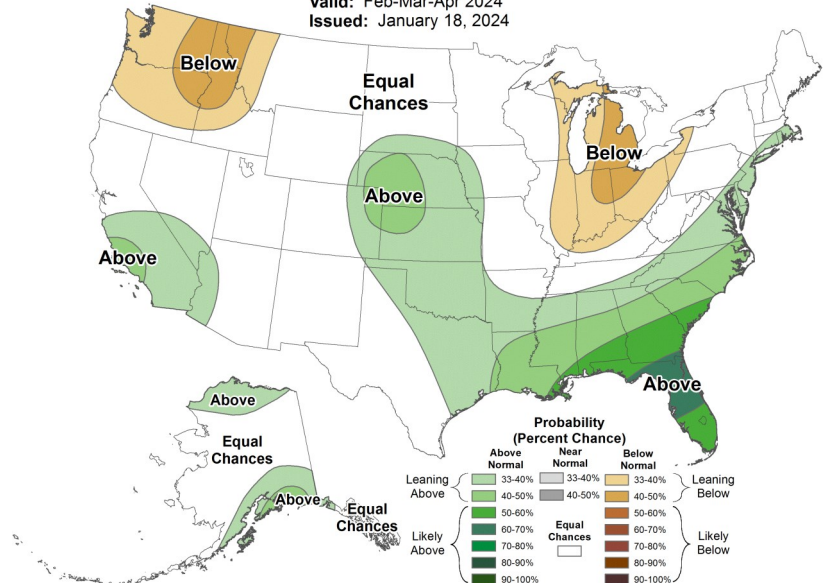
Valid: Feb-Mar-Apr 2024
Issued: January 18, 2024



Seasonal Precipitation Outlook



Valid: Feb-Mar-Apr 2024
Issued: January 18, 2024



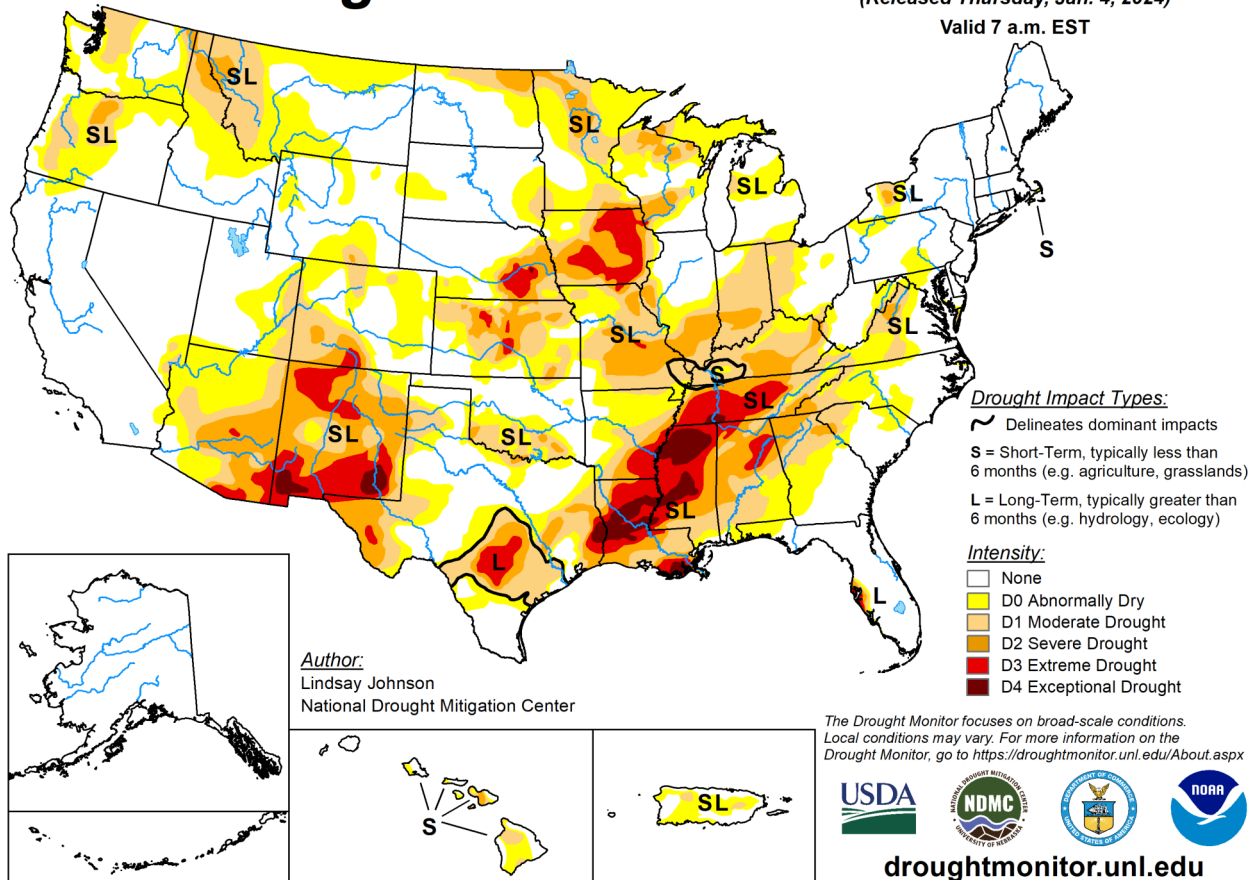
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Three Month Summary

The three month seasonal temperature outlook shows equal chances for above, below, and near normal temperatures and above normal precipitation for the Tri-State Area during the period January, February, and March of 2024.

U.S. Drought Monitor

January 2, 2024
(Released Thursday, Jan. 4, 2024)
Valid 7 a.m. EST



The latest U.S. Drought Monitor shows the Tri-State Area having drought conditions between the D0 and D1 intensities for most of the region.

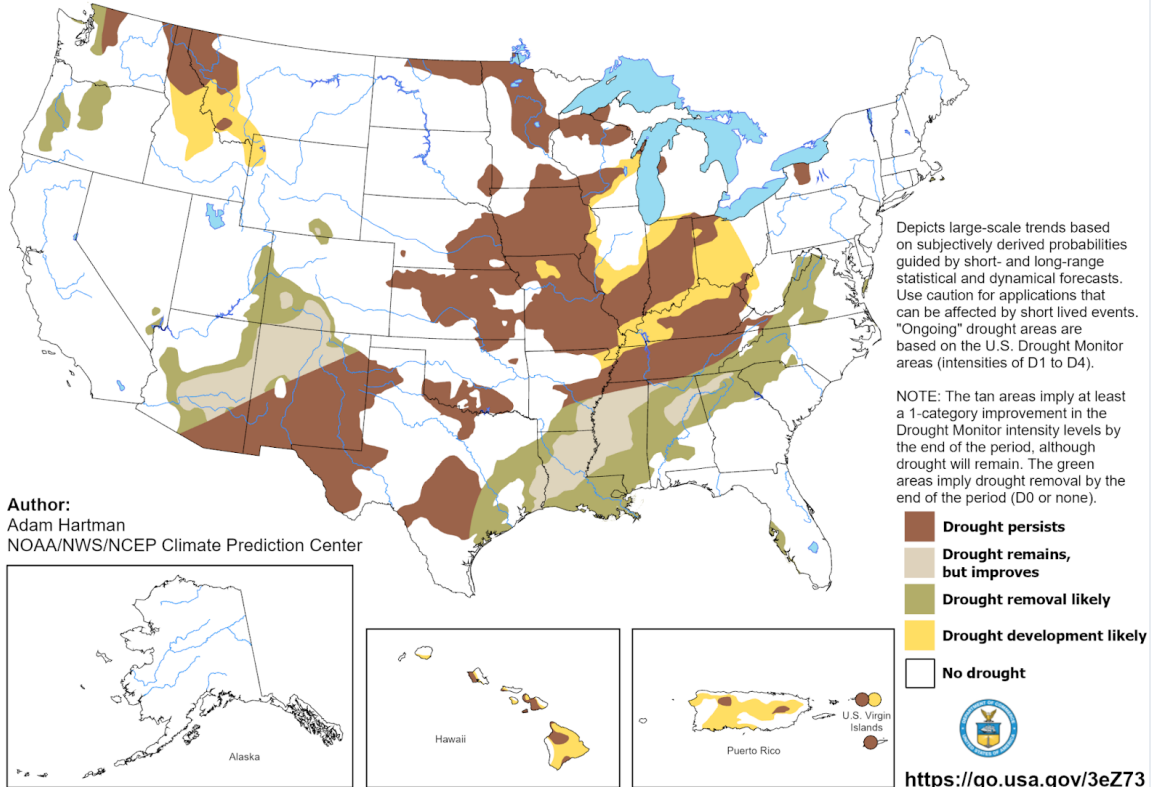
City	Year to Date* Precipitation (in.)	Normal Year to Date* (in.)	Departure from Normal (in.)
Goodland	22.11	19.09	+3.02
Burlington	18.12	17.09	+1.03
McCook	25.13	20.05	+5.08
Hill City	17.12	21.50	-4.38

Data as of January 1, 2024

U.S. Seasonal Drought Outlook

Drought Tendency During the Valid Period

Valid for December 21, 2023 - March 31, 2024
Released December 21, 2023



The latest U.S. Seasonal Drought Outlook shows drought persisting within portions of Northwest Kansas and East-Central Colorado, while the remainder of the region expects to be without drought conditions for the three month period of January through March of 2024.

**A little water can show how
little water there is around it.**

Show us what it looks like around you

Submit photos to the **Condition Monitoring
Observation Report database.**

NDMC
NATIONAL DROUGHT MITIGATION CENTER
UNIVERSITY OF NEBRASKA

go.unl.edu/cmor_drought



WRN Ambassador News

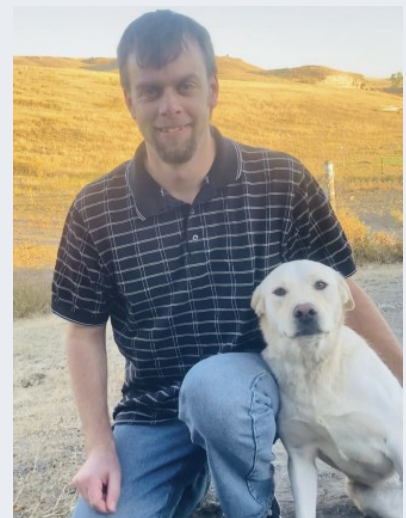
Message from the WCM

As the new Warning Coordination Meteorologist (WCM) of the Goodland office I look forward to serving you in the years to come. My wife and I have lived in Northwest Kansas for the last 13 years, enjoy the rural lifestyle of Northwest Kansas, and plan to continue to raise our family here. I enjoy meeting with the partners we work with and the people we serve to learn how our information is used to make decisions, as well as listen to ways we can improve our services.

For those who may not be familiar with what the role of the WCM is, I essentially serve as the interface between the office and those we serve. I also meet routinely with the various partners we serve (schools, DOT, emergency managers, media, etc.) to maintain relationships with them so our office is aware of the different types of weather information they need to make decisions as this may change over time. I am also responsible for leading the outreach activities of the office. This includes scheduling visits to schools, tours of the office, or participating in community events, and overseeing the storm spotter training.

Speaking of storm spotter training, we are a month or so away from spotter training beginning for your county. [Here](http://www.weather.gov/gld/2024spottertraining) (www.weather.gov/gld/2024spottertraining) are the dates and locations for the upcoming spotter training season. Regardless if you have never attended, or have attended more classes than you can count, please make plans to attend a spotter training class near you. Our staff is diligently working to bring in new material, including new pictures/video and material in general, to keep the training fresh and interesting. We look forward to seeing you at the upcoming training classes.

If you would like a tour of the office, want to have us present a weather topic at your school or organization, or have a question about a service we provide, please contact me at Jesse.Lundquist@noaa.gov. I look forward to working with you in the months and years to come.



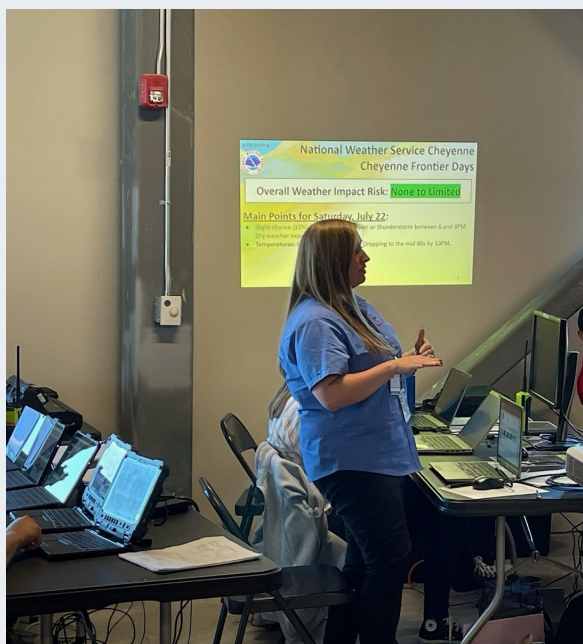
-Jesse Lundquist, Warning Coordination Meteorologist

WRN Ambassador News**2023 Weather-Ready Nation Ambassador of Excellence****By Kalitta Kauffman**

*Courtesy of:
Jake Rockwell*

This year's NWS Goodland WRN Ambassador of Excellence is Yuma County Emergency Management Director Jake Rockwell. Jake has been a proactive Emergency Manager and Weather-Ready Nation Ambassador since taking the job in June of 2022. Jake shares our weather safety and preparedness graphics on Facebook and also shares other weather information ahead of hazardous weather via email. During the 2023 Spring Storm Spotter season, Jake requested two additional classes be held in his county to better reach those who couldn't travel to the initial class. One of the classes was held privately for city of Yuma employees while the other was open to the public. This past May Jake, the Yuma City Manager, and the Wray City Manager requested assistance from NWS Goodland to evaluate tornado shelter options in their cities as well as the town of Eckley. Jake's proactiveness this year was very beneficial when Yuma County had seven tornadoes on August 8th, 2023, including an EF-3 that impacted the south side of the city of Yuma.

To see all recognized organizations across the region or past winners, visit:
https://www.weather.gov/wrn/ambassador_recognition

WRN Ambassador News**NWS Goodland Supports Neighboring Offices****By Kyle Knight**

Kalitta (Center) giving a weather briefing to officials with the Cheyenne Frontier Days.

NWS Goodland has had multiple opportunities this year to partner with surrounding weather forecast offices to help them with various events and issues. The support included Kalitta Kauffman providing weather updates for Cheyenne Frontier Days, Kyle Knight providing weather updates for the Nebraska Land Days, and the Electronic Technician Staff helping NWS Pueblo with maintenance on their automated stations. Our staff assisting with these events allowed other offices to provide more support for ongoing events and better maintain equipment in their area. These opportunities allowed the staff to improve their decision support skills, visit surrounding forecast

areas, understand some of the challenges that come with different biomes, and improve collaboration and understanding with neighboring offices. Thanks to these experiences and inter-office collaboration, the National Weather Service will be better equipped to meet the future needs of partners and those who rely on the Weather Service's decision support service.



Kyle (Front) monitoring a storm near the venue for potential lightning activity.

WRN Ambassador News**Hazard Simplification Coming Soon!****By Kalitta Kauffman**

Have you heard the news? The National Weather Service is working on replacing "Advisories" and "Special Weather Statements (SPSs)" with plain language headlines featuring clear, impact-based information. As of an August 17th update, the changeover is expected to occur no earlier than the 2025 calendar year. Advanced notice of when the change will occur will be provided publicly via a Service Change Notice (SCN) at least 6 months prior.

"So, what will the change look like?", you may ask. With these changes headlines will be transitioned to a "What, Where, When, Impacts" bulleted format. Headlines will also change to be more plain language, with the hazard name leading the description. For example, you may see a Winter Weather Advisory headline for snow be seen as "SNOW: Hazardous travel in snow and blowing snow from 9 AM to 8 PM."

For any questions you may have, or for more information, feel free to contact the NWS Goodland office or visit <https://www.weather.gov/hazardsimplification/>.

Text Product Examples**Before: Advisory**

/O.NEW.KBMX.WW.Y.0001.200208T1000Z-200208T1700Z/Cherokee-Including the city of Centre 815 PM CST Fri Feb 7 2020

WINTER WEATHER ADVISORY IN EFFECT FROM 4 AM TO 11 AM CST SATURDAY.

- * WHAT...Total snow accumulations of up to one inch.
- * WHERE...Northern Cherokee County.
- * WHEN...From 4 AM to 11 AM CST Saturday.
- * IMPACTS...Plan on slippery road conditions.

Now: Plain language headline

/O.NEW.KBMX.WW.S.0001.200208T1000Z-200208T1700Z/Cherokee-Including the city of Centre 815 PM CST Fri Feb 7 2020

SNOW: Hazardous travel from 4 AM to 11 AM CST Saturday.

- * WHAT...Total snow accumulations of up to one inch.
- * WHERE...Northern Cherokee County.
- * WHEN...From 4 AM to 11 AM CST Saturday.
- * IMPACTS...Plan on slippery road conditions.

Before: Special Weather Statement

North Snowy Range Foothills-Including the cities of Arlington and Elk Mountain 1143 PM MDT Mon Sep 23 2019

...Strong westerly winds until this evening...

Strong westerly winds will pick up this morning by 7 AM and continue through the day, finally diminishing by 6 PM. Sustained winds around 30 mph with gusts of 45 to 50 mph are possible.

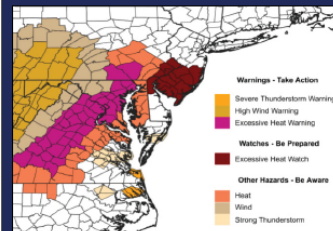
Now: Plain language headline

/O.NEW.KCYS.WLS.0001.190923T0543Z-190923T0000Z/

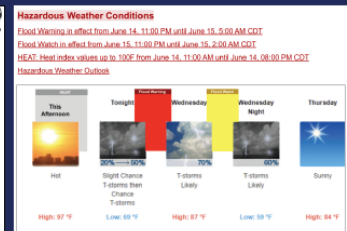
North Snowy Range Foothills-Including the cities of Arlington and Elk Mountain 1143 PM MDT Mon Sep 23 2019

WIND: Strong westerly winds 7 AM to 6 PM CST Tuesday.

- * WHAT...Sustained winds of 30 mph with gusts of 45 to 50 mph.
- * WHERE...North Snowy Range Foothills.
- * WHEN...Tuesday 7 AM to 6 PM.
- * IMPACTS...High profile vehicles will be most impacted.

Visual Display Examples

National Map Display



Local Forecast Page



NWS Goodland Shareholders Report 2023

State of the Climate

Written By: Tyler Trigg

The National Weather Service (NWS) Goodland Climate program strives to record and quality control all weather data daily to provide the most accurate climate database for the Tri-State Area. Additional responsibilities include issuing monthly and annual reports for all four of our automated observing sites (Goodland, Burlington, Hill City, and McCook), along with assisting in the quality control of all our COOP sites across our 19 counties monthly. We also provide input to the Drought Monitor on local conditions, coordinate with the High Plains Regional Climate Center and local climatologists routinely.

As we continue into the new year El Nino is expected to persist through the spring. El Nino years typically favor below normal temperatures for the winter and spring. This weather pattern makes the area more susceptible to arctic air outbreaks, which we have seen thus far. Above normal precipitation is favored in El Nino years, along with the potential for above normal snowfall. Our average snowfall during a winter season is around 30 inches; we have already received around 25 inches at Goodland. Despite the ongoing strong El Nino, confidence is increasing that La Nina returns this summer; which typically favors below normal precipitation. If this occurs the drought is expected to return.

From a product standpoint, a new modernized Drought Information Statement has been created to give more of a visual representation of all the factors that contribute to drought and the changing conditions. The latest statement can be found [here](https://www.weather.gov/gld/DroughtInformationStatementGLD) (https://www.weather.gov/gld/DroughtInformationStatementGLD). Since this is a relatively new product, please contact us regarding any comments or improvements you may have about it.

Due to the primary industry in the Tri-State Area being agriculture, additional emphasis has been placed on better relaying additional climate variability information, and other related resources, to better serve the public.

The graphic is a blue rectangular box with white and yellow text. At the top left is the NOAA logo. Below it is the National Weather Service logo, which features a circular emblem with a lightning bolt and the words "NATIONAL WEATHER SERVICE". To the right of these logos, the title "Drought Information Statement for the Tri-State Area" is written in large, bold, white letters. Below the title, the text "Valid December 04, 2023" is written in white. Further down, the text "Issued By: WFO Goodland Kansas" and "Contact Information: 785-899-2360, nws.goodland@noaa.gov" is written in white. Below this, there are three bullet points in white text: "This product will be updated by the 5th of each month or sooner if drought conditions change significantly.", "Please see all currently available products at https://drought.gov/drought-information-statements.", and "Please visit https://www.weather.gov/gld/DroughtInformationStatement for previous statements." At the bottom of the graphic, there are three small images: a close-up of cracked, dry earth, a field of dry, yellowed grass, and a landscape with a body of water and trees. At the very bottom of the graphic, there are two small circular logos on the left and the text "Department of Commerce // National Oceanic and Atmospheric Administration" on the right.

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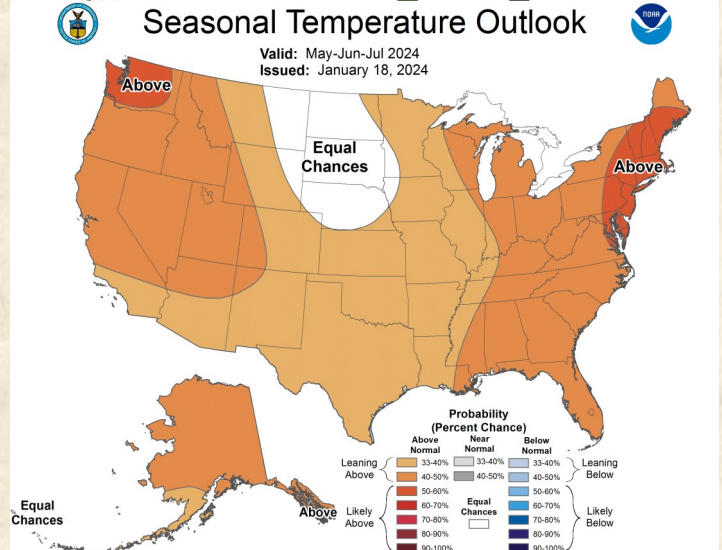
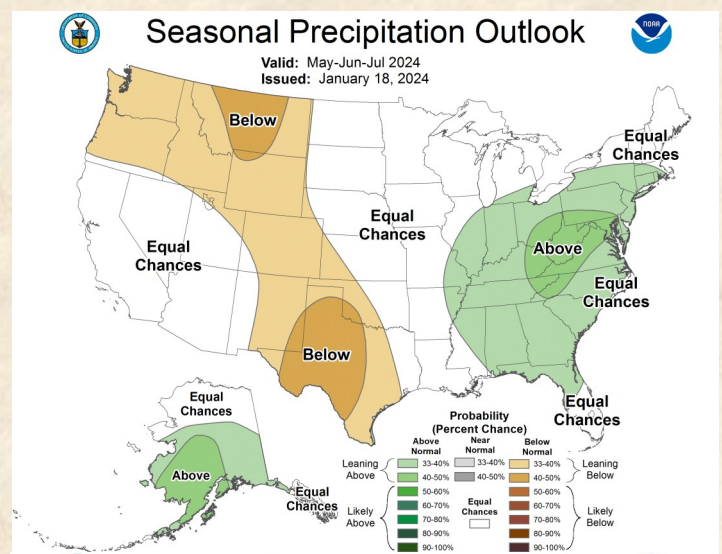
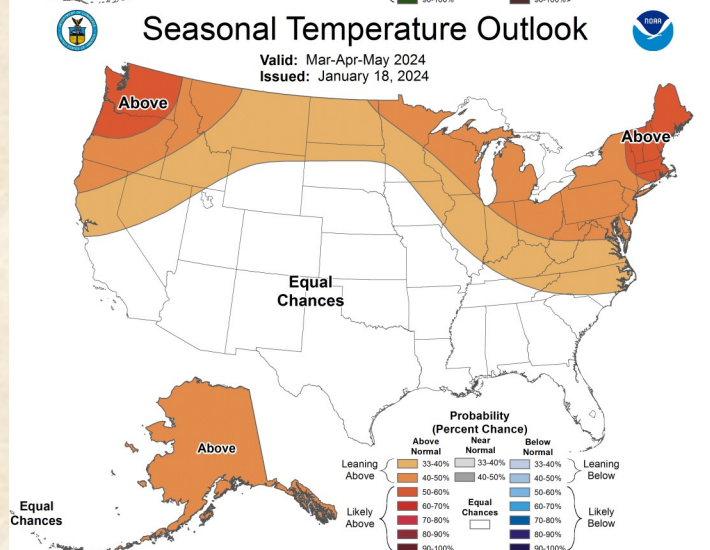
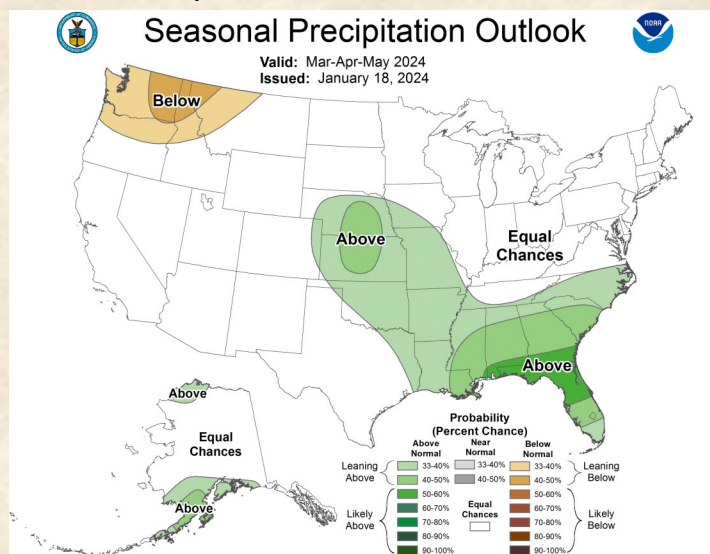
State of the Climate (Continued)

Written By: Tyler Trigg

This added emphasis includes forging new relationships with local agriculture agencies to find out more about what kind of information is helpful for not only them, but everyone we serve in the Tri-State Area.

As we head into 2024 and beyond, more emphasis will be placed on climate variability as the NWS pursues the Climate Ready Nation Initiative. At the Goodland office we have already begun meeting the goals of this initiative with the new Drought Information Statement and issuing monthly climate summaries which are focused on the counties we serve. There are many new exciting developments on the horizon for the program. We look forward to continuing to educate and assist those on the topic of climate variability.

Please contact us with any suggestions regarding how we can continue to improve the climate services we provide.



Winter Weather

Written By: Kalitta Kauffman

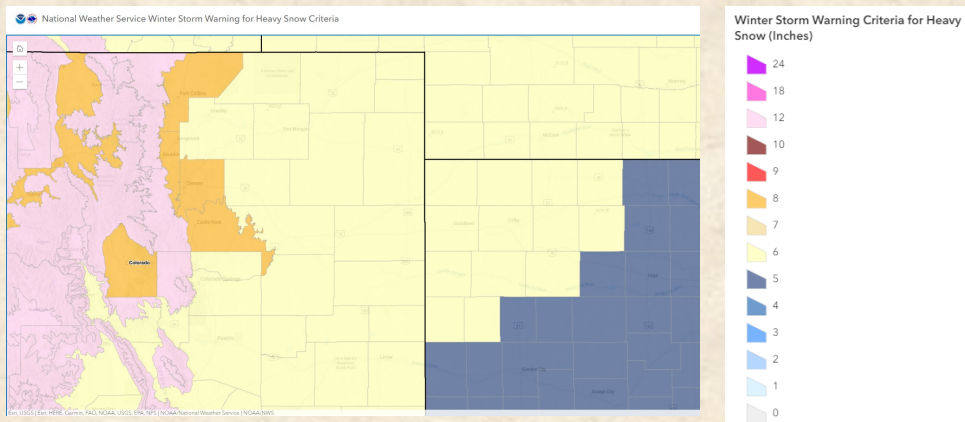
The National Weather Service (NWS) Goodland Winter Weather Program's goal is to continue finding ways to improve the services provided through Winter Weather Advisories, Watches, and Warnings.

This year, the focus continues to be improving the communication of probabilistic forecast information to the public and our partners, as well as improving our ability to warn on heavy snow and snow squall events. To improve the office's communication of probabilistic forecast information, the meteorologists worked through several training modules. These training modules covered communicating probabilistic information in regards to banded snowfall, extreme cold, heavy snow, mixed precipitation, large winter storms, and blizzards. Probabilistic information will help the staff better communicate the range of possible outcomes for a particular weather parameter instead of a specific value. This will help partners and customers be better prepared for a particular weather event because they will be aware of the different weather scenarios that may occur.

Beginning during the 2023-2024 winter season, the Goodland office will be able to issue general Snow Squall Warnings or Snow Squall Warnings with Impact-Based Warning (IBW) Tags. The general warning will not set off the Wireless Emergency Alerts (WEA) and can be issued any time of day. The "Significant" tag will only be used when snow squalls are expected to have a substantial threat to safe travel. Snow squall warnings of this magnitude will set off the WEA. The use of the IBW tag will ensure that WEA activation is reserved for high impact events, mitigating the issue of WEA overuse.

Another update for the National Weather Service is the new warning criteria for heavy snow. NWS Goodland did not make any changes to the criteria of six inches for the counties we cov-

er; however, the Dodge City and Hastings offices have lowered criteria in their Kansas counties to five inches.



Continued next page...

Winter Weather (Continued)

Written By: Kalitta Kauffman

These minor changes are expected to have limited impact to our users as offices may still issue any watches and warnings based on anticipated impacts. The image on the prior page shows the criteria for the Tri-State Area and some of our surrounding counties. For more information you can contact our office or visit www.weather.gov/snow-criteria.

The October 2022 - September 2023 WFO Goodland

Water Year In Review

Written By: Jason Neilson

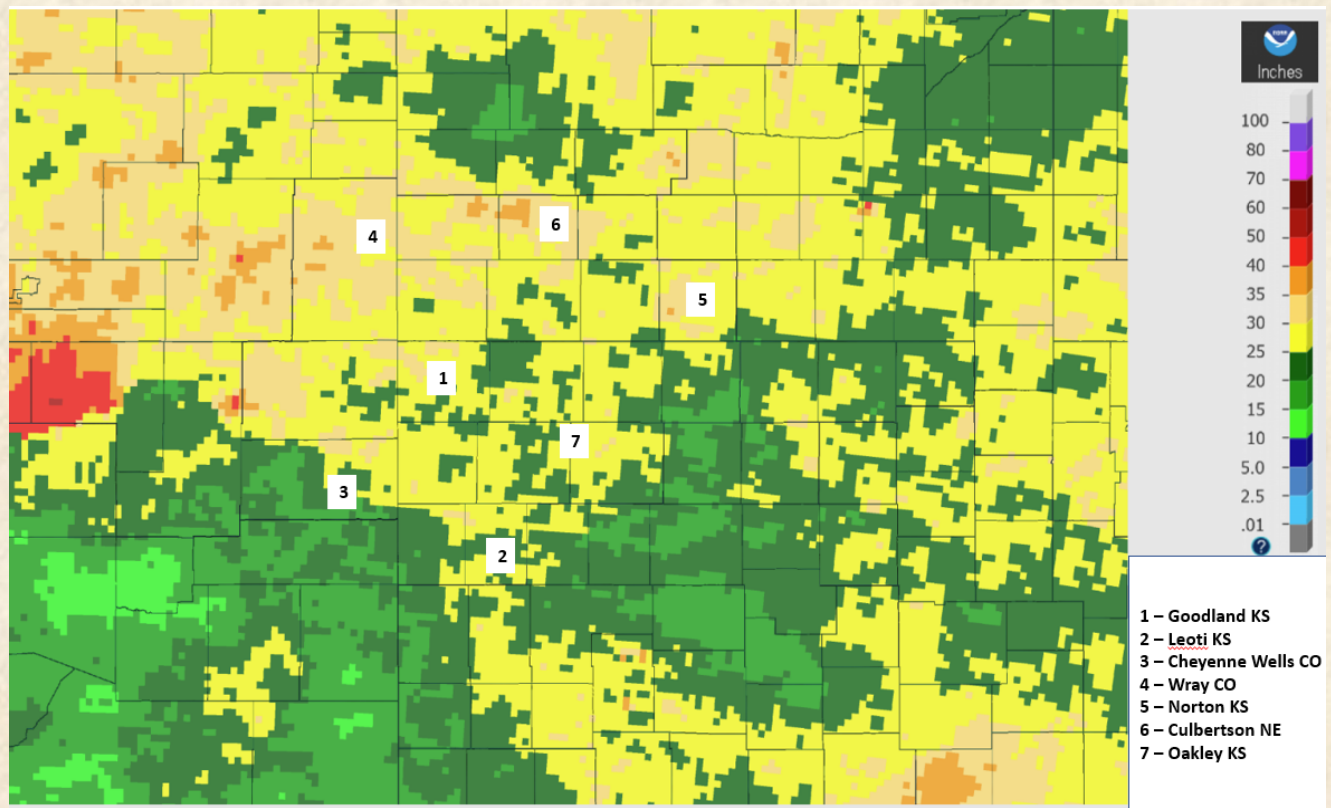
What is a Water Year??

[US Geological Survey](#) (USGS) defines a Water Year as the period between October 1 of one year and September 30th of the next. The water year is designated by the calendar year in which it ends. Its beginning differs from a calendar year because part of the precipitation that falls in late autumn and winter accumulates as snow and does not drain until the following spring snowmelt.

Information below obtained from WFO Goodland [AHPS](#) site

Current and previous month(s) climate data can be found [here](#)

Observed Precipitation for the 2023 Water Year



Continued next page...

The October 2022 - September 2023 WFO Goodland Water Year In Review (Continued)

Written By: Jason Neilson

River Flood/Flood/Flash Flood Warnings issued by Month

	<u>River Flood</u>	<u>Flood</u>	<u>Flash Flood</u>
October 2022	0	0	0
November 2022	0	0	0
December 2022	0	0	0
January 2023	0	0	0
February 2023	0	0	0
March 2023	0	0	0
April 2023	0	0	0
May 2023	0	70	57
June 2023	0	24	13
July 2023	0	12	14
August 2023	0	10	6
September 2023	0	2	4

	<u>YUMA</u>	<u>DUNDY</u>	<u>HITCHCOCK</u>	<u>RED WILLOW</u>	
	14	20	20	17	
		<u>CHEYENNE</u>	<u>RAWLINS</u>	<u>DECATUR</u>	<u>NORTON</u>
		9	13	16	8
	<u>KIT CARSON</u>	<u>SHERMAN</u>	<u>THOMAS</u>	<u>SHERIDAN</u>	<u>GRAHAM</u>
	33	13	14	8	14
	<u>CHEYENNE</u>	<u>WALLACE</u>	<u>LOGAN</u>	<u>GOVE</u>	
	20	23	12	9	
		<u>GREELEY</u>	<u>WICHITA</u>		
		6	6		

Map shows the amount of times each county was in a Flood/Flash Flood Warning.

Continued next page...

The October 2022 - September 2023 WFO Goodland Water Year In Review (Continued)

Written By: Jason Neilson

October 1 - December 31 2022

A pretty quiet three month period to end the 1st quarter of the Water Year. Below normal precipitation occurred for all three months. Dry soil conditions around the Tri-State Area helped to absorb any rain received, as well as any melted snowfall.

January 1 - March 31 2023

Another quiet three month period. The second quarter of the Water Year started out on a good note with Jan/Feb seeing mostly above normal precipitation, but going into March, mainly below normal precipitation was received.

April 2023

With the assistance of the WFO Boulder Hydrologist, the staff gauge(s) at RSPK1 just south of Russell Springs, KS were surveyed and painted on the new bridge. The current bridge is a replacement for the previous one which was torn down. Unfortunately our previous staff gauge(s) went with it. The new gauges will allow our staff to continue to provide more accurate Flood/River Flood Warnings now that river stage readings can be taken again at the site.

Below normal precipitation was received during this month, and with dry ground conditions, the rainfall received was easily absorbed, leading to no flooding issues. As seen from the precipitation image on the next page, the heaviest rainfall was seen mainly west of Highway 25 and along/south of the Interstate.



Continued next page...

The October 2022 - September 2023 WFO Goodland Water Year In Review (Continued)

Written By: Jason Neilson

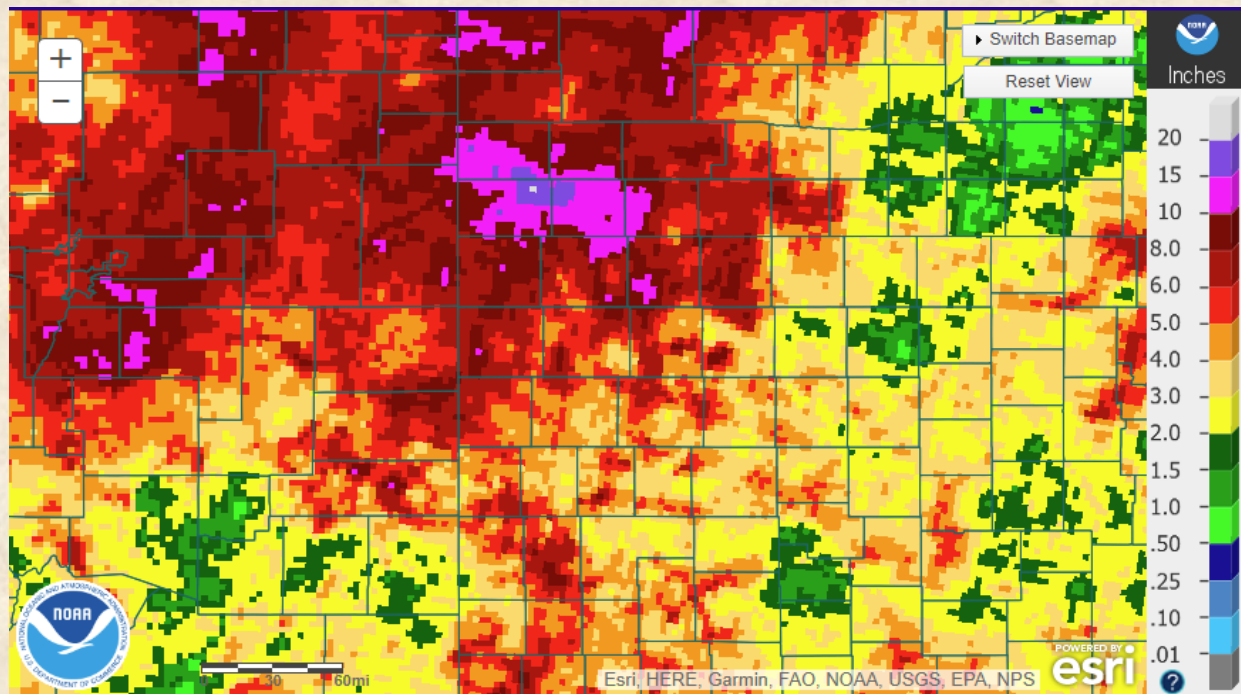
May 2023

The month of May was very active across the entire Tri-State Area.

Numerous Flood/Flash Flood Warnings were issued, with the heaviest rainfall occurring during the middle portion of the month. As seen from the precipitation image below, many locales along/north of the Interstate received 5 inches of rain or higher, with the focus of 10+ inches occurring mainly in Dundy and Hitchcock counties of Southwest Nebraska. Portions of Red Willow County in Nebraska, as well as Cheyenne, Rawlins and Decatur counties in Kansas, saw some of the highest totals.

Heavy rainfall also occurred from the 25th through the 29th. This resulted in some River Flood Warnings being issued, in addition to several flood and flash flood warnings for Hitchcock and Red Willow counties. The gauges that were affected were: Frenchman Creek at Culbertson, NE, Republican River at Stratton, NE, Republican River at McCook, NE, Driftwood Creek near McCook, NE, and Beaver Creek at Cedar Bluffs. These gauges, and others, can be found on our AHPS web page for a while before a new site replaces AHPS this spring.

May Observed Precipitation



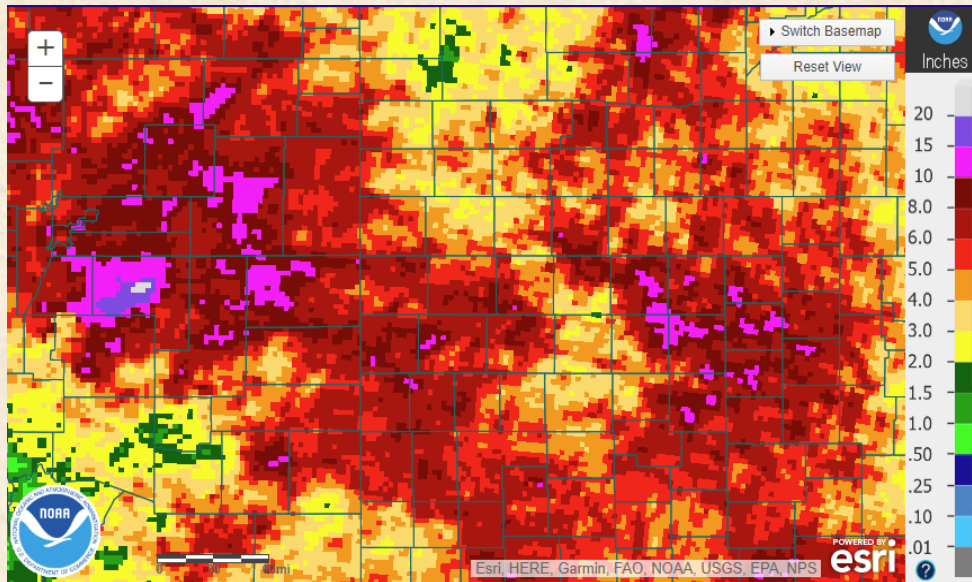
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The October 2022 - September 2023 WFO Goodland Water Year In Review (Continued)

Written By: Jason Neilson

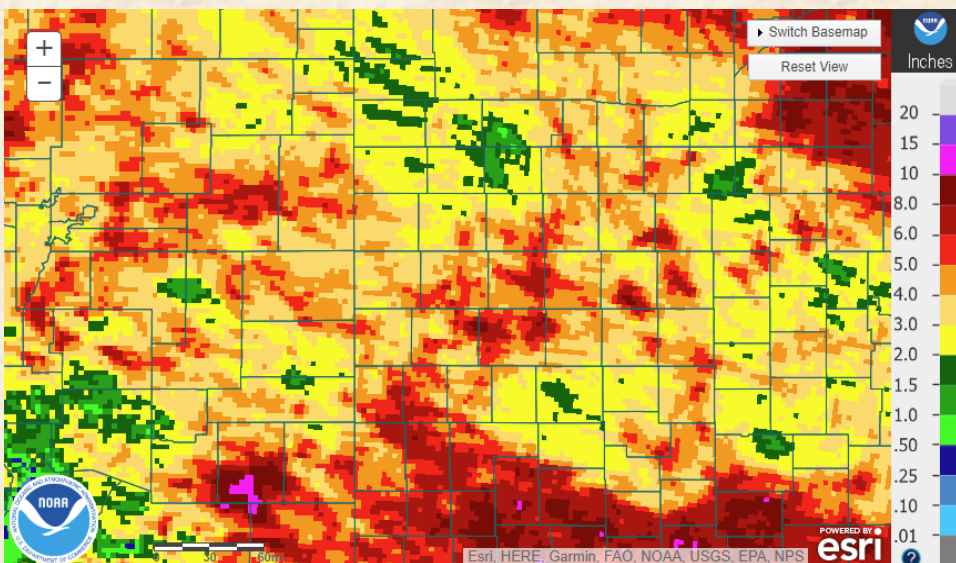
June 2023

Another active month with the greatest thunderstorm traffic mainly seen east of Highway 83, and along/west of a line from Wray, CO through Gove, KS. Some areas received at least 8 inches of rain, with a few isolated spots receiving near 10 inches.



July 2023

This month had less thunderstorm coverage compared to May and June. However the storm track from the activity that did occur still gave areas along/south of the Interstate close to four to six inches.



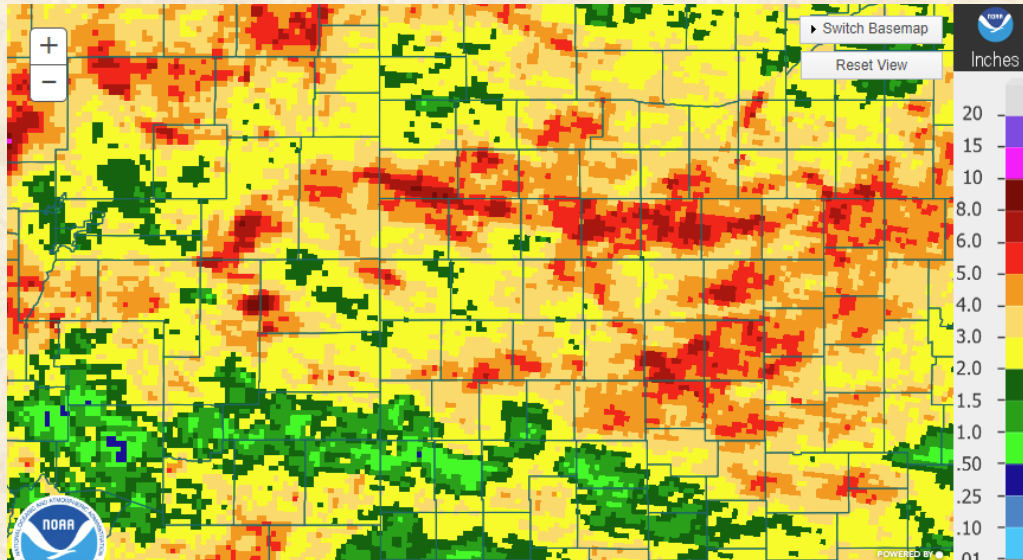
Continued next page...

The October 2022 - September 2023 WFO Goodland Water Year In Review (Continued)

Written By: Jason Neilson

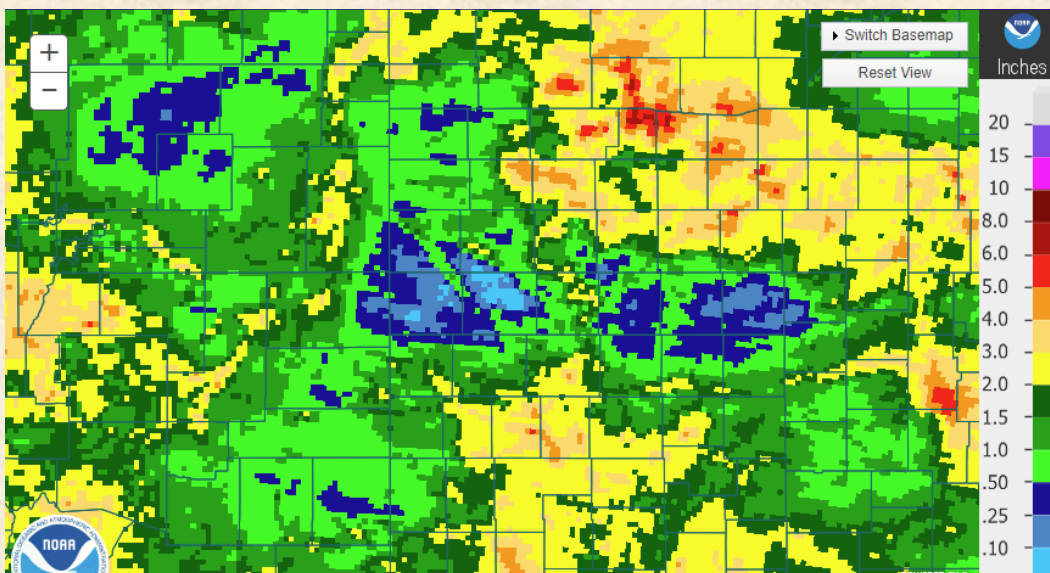
August 2023

Coverage was similar to July, with the focus for most storm activity occurring along/north of Highway 36.



September 2023

Even less storm activity occurred in September. However some flood warnings were still issued mostly along/north of Highway 36 and east of Highway 25.



Continued next page...

The October 2022 - September 2023 WFO Goodland Water Year In Review (Continued)

Written By: Jason Neilson

Product Change Coming!

Over the coming months during the new water year our office, and the rest of the National Weather Service, will be transitioning from the AHPS (Advanced Hydrologic Prediction Service) website that the above images were generated from, to the new NWPS (National Water Prediction Service) website. The new website will provide new data, along with the data you can access through the current website. We will send out the new web address when it becomes available.

CoCoRaHS Summary for 2023

Written By: David Thede

CoCoRaHS (Community Collaborative Rain, Hail & Snow Network) is used by a wide variety of organizations and individuals. The National Weather Service, other meteorologists, hydrologists, emergency managers, city utilities (water supply, water conservation, storm water), insurance adjusters, USDA, engineers, mosquito control, ranchers and farmers, outdoor & recreation interests, teachers, students and neighbors in the community are just some of the examples of those who visit the CoCoRaHS web site and use their data.

In 2023, the program had 148 active stations across Northwest Kansas, extreme Southwest Nebraska and far Eastern Colorado. In 2022, there were 138 active stations. Active stations are defined as those who reported at least one observation over the past 365 days.

A summary of reports from January 1, 2023 to December 31, 2023 highlight the top 10 precipitation amounts (rain and melted snow) for counties in our forecast area (Colorado, Kansas, Nebraska).

Colorado:

CO-CH-34 (Arapahoe 8.4 NNE) – 23.38"

CO-KC-80 (Burlington 8.4 NNE) – 22.05"

CO-YU-68 (Wray 4.2 NNE) – 21.95"

CO-YU-130 (Yuma 5.9 NNE) – 21.09"

CO-KC-80 (Liberty 15 SW) – 20.99"

CO-KC-84 (Stratton .25 WNW) – 20.25"

CO-YU-130 (Yuma 5.9 NNE) – 19.55"

CO-KC-141 (Stratton 14.2 N) – 19.54"

CO-CH-37 (Cheyenne Wells 4.2 NNE) – 19.42"

CO-YU-129 (Yuma 4.6 N) – 19.25"

Kansas:

KS-NT-14 (Norton 1.3 SSW) – 26.81"

KS-RA-24 (McDonald 0.2 N) & KS-SH-16 (Goodland 10.3 WNW) – 26.75"

Continued next page...

CoCoRaHS Summary For 2023 (Continued)

Written By: David Thede

KS-RA-25 (Herndon 1.7 NNW) – 26.29”

KS-TH-17 (Colby 1.3 NE) – 25.52”

KS-WH-5 (Leoti 6.4 SSW) – 25.43”

KS-SH-2 (Goodland 11 NNE) – 25.10”

KS-WH-8 (Leoti 14.6 SSE) – 24.47”

KS-DC-9 (Oberlin 5.0 W) – 23.96”

KS-LG-10 (Oakley 0.3 NE) – 23.59”

KS-WA-1 (Sharon Springs 10 S) – 23.46”

Nebraska:

Red_019 (McCook 4.6 NNW) – 31.37”

Red_026 (McCook 7.0 SSW) – 30.77”

Red_001 (McCook 5.4 SW) – 30.39”

Red_022 (McCook 0.6 NW) – 29.38”

Hitc028 (Culbertson 2.0 E) – 28.21”

Hitc022 (Stratton 7.9 NNW) & Dund019 (Parks 6.0 NW) – 27.90”

Dund_015 (Wauneta 6.5 S) – 27.56”

NE-HK-1 (Culbertson 0.7 NW) – 27.53”

Dund_020 (Wauneta 5.8 S) – 26.90”

Dund_011 (Max 4.6 WNW) – 26.01”

A complete report for every site across the country is available at <https://wys.cocorahs.org/>

Other ways to view precipitation data for any CoCoRaHS site in the country is available here

<https://cocorahs.org/ViewData/>. If you're interested in participating in the CoCoRaHS program visit cocorahs.org

Cooperative Observation Program / COOP

Written By: Drew Mantei

This last year has been a year of collaborations. We've had a team member participate in the COOP course at the National Weather Service Training Center, as well as a regional event for Observational Program Leaders (OPL'S) / COOP team leads (The first gathering of regional OPL's within the last decade). There we discussed how to continue modernizing the program, supply issues, CoCoRaHS news, and COOP observer retention, recruitment strategies, and continue to extend helping hands with neighboring Weather Forecast Offices.

COOP Observers are always in demand and in flux. The recruitment for volunteers is always a focus. The COOP Team is continuing to be involved with outreach activities so we may voice the importance of the program and gain dedicated COOP members.

Goodland's COOP Team is continuously improving the quality assurance practices with data that comes in from our observers. Our goal is to ensure our ob-



servers have healthy habits when it comes to filling out forms for weather observations. We acknowledge these tasks are completed within their personal routine; while also retaining the importance of receiving and maintaining accurate data. We are grateful for all those who exercise their right to participate in the COOP program.

In 2024, the COOP team will train observers to shift towards documenting observations in an already available digital format. Those observers who have a mobile device or computer will receive training to go digital. This will allow us to be more accurate with our quality assurance practices, by allowing us to see near-real time errors instead of seeing potential problems at the end of the month with the paper form.

The Cooperative Observation Program for NWS Goodland is well on its way to having an exciting year in 2024.

2023 Social Media

Written By: Kyle Knight

It was another good year with social media here at NWS Goodland. We successfully implemented a new platform for disseminating our graphics, embraced more probabilistic information in our messaging, informed our followers with more educational posts, and experimented with new designs.

The transfer to the new platform also allowed us to reevaluate some of our templates and come up with some newer and fresher designs. We also now have full capabilities to backup up our neighboring office and they in turn can back us up as well.

As for embracing more probabilistic data, this will help us transform how we give information to everyone ahead of an event. One of the biggest benefits is that probabilistic information has allowed us to start giving more information about events a few days earlier than we have in the past. Instead of having to try and pin things down and give exact information, we can give probabilities of different outcomes and allow our followers to make decisions based on their own comfort levels with a few extra days to prepare. Another big benefit is that probabilistic information has allowed us to better handle and inform our followers leading up to the more difficult weather events.

A prime example was a mixed precipitation event that occurred around Dec 13-14. We sent graphics out that gave the probabilities of a couple different scenarios and what conditions would lead to what outcome. This allowed our followers to either make a decision based on the probabilities of each hazard, or wait and see which conditions were occurring and then make their decisions. There is still plenty of experimentation ahead to determine how to use probabilities in a manner that will provide our followers with the most useful information. However we look forward to continue working on making our messages and information the best it can be.

For our yearly statistics, we gained another 1,925 followers on Facebook with an additional 375 followers on X (Twitter).

Slack Replaces NWS Chat

Written By: Jesse Lundquist

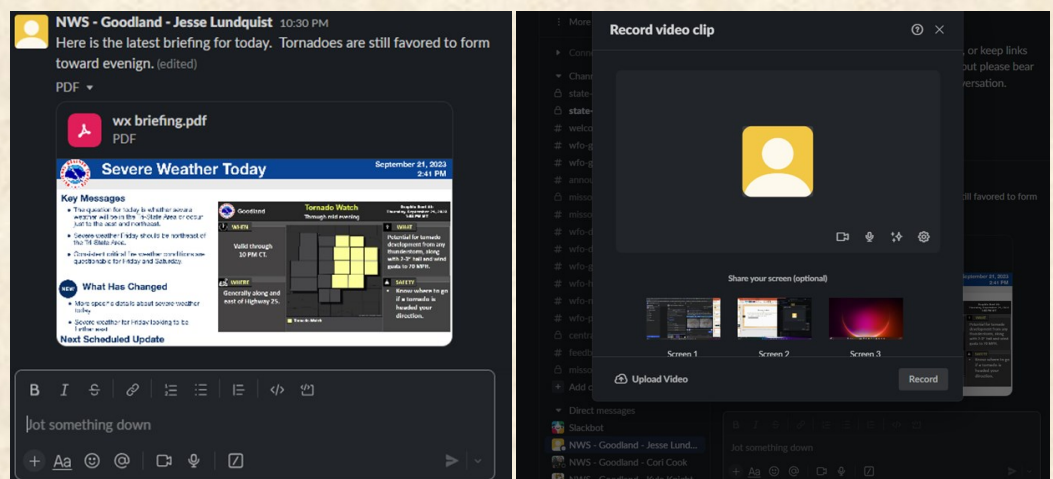
A historic change took place regarding how the NWS communicates with partners through chat. As of August last year, the NWS fully transitioned to using a new software platform called Slack. The prior chat platform, NWS Chat, has been operational for well over a decade and limited the NWS to only communicating through text. In short, the NWS had outgrown the capabilities of NWS Chat and was in need of a new chat service.

Slack has many advantages over NWS Chat. One of the biggest is that Slack is a well established software platform for communicating. This greatly reduced the growing pains and technical glitches that would accompany a change in software.

The other advantage with transitioning to Slack is the ability to communicate through not only text but also through video, audio, and be able to include pictures with text messages to help elaborate a particular point. The interface for adding video or audio to messages is very similar to using the interface of Google Meet for meetings. Partners are also able to send us pictures and video, which is a tremendous help during severe weather operations, as this type of information allows us, and anyone else in the chatroom, to easily see what our partners are seeing.

One feature of Slack that we have yet to harness is the ability to host an impromptu meeting, or Huddle, as Slack calls it. A Huddle can be between a couple users or can be shared with the entire chatroom. A Huddle is essentially an on-the-spot webinar that allows those in the Huddle to see the screen and camera of the host. This type of interface can be quite useful during severe weather events when we need to provide weather updates to those in our chatroom in a more efficient way than just through a video recording or text message.

The upgrade to Slack is a great example of how the NWS is improving the services we provide to meet the changing needs of our partners.



Useful Links

- Travel Website
 - <https://www.weather.gov/gld/TravelerPage>
- Storm Prediction Center
 - www.spc.noaa.gov
- Weather Prediction Center
 - www.wpc.ncep.noaa.gov
- Climate Prediction Center
 - www.cpc.ncep.noaa.gov
- Climate Data
 - www.ncei.noaa.gov
- CoCoRaHS
 - www.cocorahs.com
- Space Weather
 - www.swpc.noaa.gov
- SciJinks
 - scijinks.gov/



SKYWARN

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785-899-7119

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785-899-3501

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w-gld.webmaster@noaa.gov

Website:

<http://www.weather.gov/gld>

Facebook:

<http://www.facebook.com/nwsgoodland>

Twitter:

<https://twitter.com/NWSGoodland>